



THE LAKEHEAD AMATEUR RADIO CLUB JOURNAL

May 2006

HI-Q



VE3FW—LARC call sign
honours the memory of the
Founding President
P.J. "Pat" O'Shea

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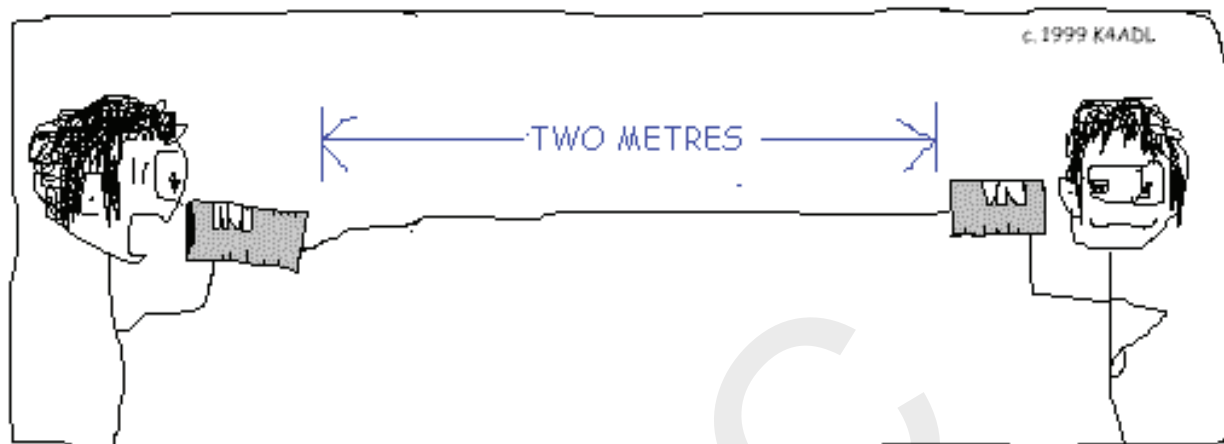


Upsala Repeater on a cold winters day in February

- Next Meeting
Thursday
May 11, 2006 at the
McIntyre Building,
Confederation College
Room 191 at 7:30 pm
- CANWARN training
Monday May 8, 7:00 pm
at St. Johns Ambulance
Centre, Fort William Road

LARC OPEN ACCESS REPEATERS

VE3YQT	Mount Baldy	147.060 (-600) Phone Patch
VE3TBR	St. Joseph's	146.820 (-600)
VE3BGA	Hillcrest H.S.	145.450 (-600) (IRLP Node VA3LU 123.0 Hz) 442.825 (+5 MHz) (100.0 Hz)
VE3UPP	Upsala	145.470 (-600)



THE EARLY YEARS



Joe VE3TBX

Lakehead Amateur Radio Club Treasurers Report

Opening Balance - April 5, 2006 \$ 4,096.02

Income

Ball Caps	\$	283.00
50/50 Draw	\$	11.00
Sale of Old Police Radios	\$	260.00
Donations	\$	100.00
Interest	\$	0.03

Total Income \$ 654.03

Expenses

Thunder Bay Telephone	\$	46.15
Bank Service Fee	\$	1.00
Office Supplies	\$	32.48
Canwarn Meeting Exp.	\$	58.85
Donation - CNIB Amateur Radio	\$	100.00
Equipment Maintenance - Labeler	\$	205.42
Total Expenses	\$	443.90

Closing Balance - May 4, 2006 \$ 4,306.15

**Joe - VE3TBX
Treasurer**



LARC April 13, 2006 MINUTES

Terry, VA3LU



Terry VA3LU

April 13 2006

Minutes of Meeting

Meeting called to order by President John Sacek **VA3JMS** at 7:38 P.M.

Members in attendance: 24

Minutes of last meeting as printed in April Hi-Q 2006. Moved by Bob **VE3BHN** and seconded by Ted **VE3IGP** to be accepted as printed. Motion Carried.

Treasurer report as printed in April Hi-Q 2006. Moved by Joe **VE3TBX** and seconded by Bob **VE3BHN** to be accepted as printed. Motion Carried.

Committee Reports

Terry **VA3LU** brought the members up to date on equipment.

Randy **VA3OJ** suggested that ARES members update their information on the ARES forms. Brought the Club up to date on The Hospital installation and the ARES 2 Meter net on Tues nights.

John **VA3JMS** updated us on up coming Canwarn Training to take place on May 8 at the St. John ambulance building 7pm to 10 pm. needs some volunteers to help set up chairs.

Old Business:

Bill **VE3XT** updated club on the conclusion of the ham classes. Insurance for Liability has gone up to about \$1000.00 a year and we are looking to reduce the costs. Suggested we get rid of equipment replacement and just go with liability only. The executive will look at all the options, costs, and make a suggestion for the May Meeting.

New Business:

Bruce Hyder on up coming kayak race on Canada Day and will be looking for some volunteers to help out. Bruce also donated \$100.00 to the club for last years help. Brad and Wayne to meet and get the details.

Joe **VE3TBX** talked about getting some hats and crest made up and was taking orders after the meeting.

Field day was brought up, and decided to take place at Randy **VA3OJ** QTH.
50/50 Draw was won by **VE3XLB**
Motion to adjourn by Terry **VA3LU**

Terry VA3LU

Monitoring & Tracking Ships via 2m Packet Radio

Bob VA3ROM

I wrote this article during the past few days of rain, it's still a bit rough, but I wanted to get it out before the summer begins. It's a very basic introduction, and if it whets your appetite then go through the weblinks at the end of the article. This is really neat stuff! Packet radio is alive and kicking in the commercial radio world!

With just a 2 metre mobile VHF radio, or a dedicated VHF AIS receiver, or a VHF scanner, your computer, and a sound card or serial port, you can monitor and track commercial ships & other craft, in and around the VHF coverage area. Since we are rather fortunate to be located on Lake Superior and a major port (Thunder Bay, of course), you can have a lot of fun and learn a few things about the marine industry. If you're a sailor, you will really appreciate the AIS VHF transponder system for traffic avoidance. Big ships always have the right of way no matter what the Collision Regulations say!



Bob VA3ROM

What is AIS?

AIS is the Universal Shipborne Automatic Identification System; a ship transponder system that is currently used by most of the commercial shipping industry. AIS uses two marine VHF channels, an AIS transponder system that transmits a 1/30s, 9600-baud packet burst, every few seconds that contains information about the ship and its voyage. With the appropriate receiver and software, you can decode these radio signal into a NMEA (the format standard used) data sentence that can be accessed using a standard RS232 serial interface, or a sound card, and displayed on a chart overlay. This gives you a radar-like display of ships in the area using AIS. However, unlike radar, you don't have the problems associated with ground clutter, precipitation, ghost images, small reflecting area, etc., affecting the system.



Packet radio was developed and pioneered by amateur radio operators. It was at a peak in 1990's just prior to the wide spread use of the Internet and World Wide Web. The amateur radio world, in most part, has abandoned packet radio (there are exceptions), but it has been adopted by the commercial radio world, and its application has found new uses, especially in this post 9/11 world.

Typical Shipboard AIS transponder system

A transponder is an electronic device that both transmits and responds to other transponders or radar systems. In air traffic control systems there are two types of radar used: primary and secondary. Most of us are familiar with the primary radar system. A radio signal is transmitted using a rotating dish antenna. If the radio signal is reflected back by something, a blip will appear on the radar display. But, you can't select what you want to see. Rain, snow, hills, ships, planes, etc., can all reflect the radio signal back and confuse the radar operator.

Secondary surveillance radar (SSR), on the other hand, use airborne transponders that transmit a unique and user selectable code that will only respond to the SSR radio signal in the area that they are flying. For example, a controller may tell a pilot to "Squawk ident 1-6-0-0." Only aircraft "squawking" this identification will show up on the SSR radar display. This cuts down on the screen clutter of other radar targets and keeps the controller focused on only the aircraft in that sector. Transponders also tell the controller the aircraft flight name, the course and speed over ground, the altitude, and other pertinent information, etc. Other aircraft that have a SSR onboard can also sweep the area and get relevant traffic information. Usually, only military aircraft carry such equipment. Commercial aircraft rely solely on the ground SSR system using air controllers to avoid collisions and arrange landings and takeoffs from airports. If there is an in-flight emergency, loss of communications, etc., there are international unique codes to alert the air traffic controller(s).

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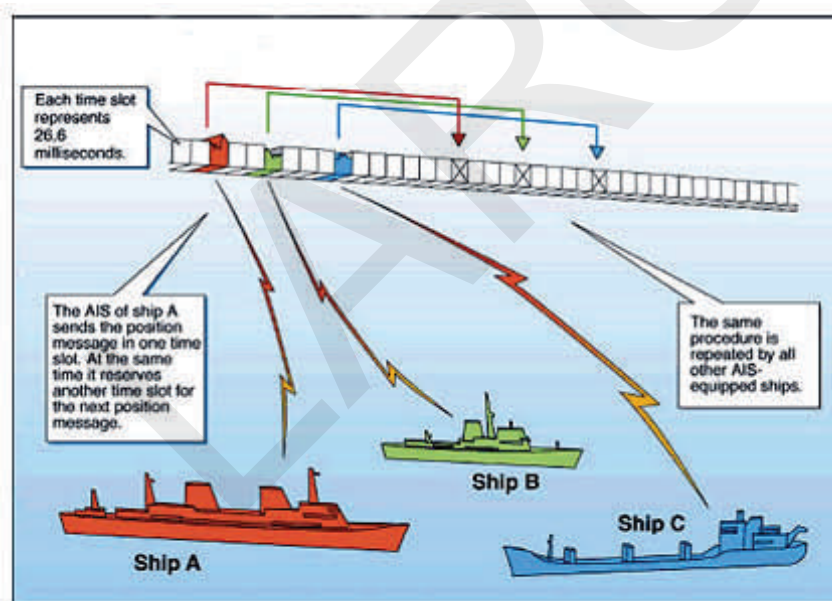


Monitoring and Tracking Ships (continued from previous page)

With a shipboard AIS system no radar system is required at all! The AIS system on each ship talks to others in the area and automatically arranges their packet burst timing sequences to avoid packet collisions using 2 alternating marine channels. The power output level is 12.5 watts, which is adequate for line of sight communications. The range will vary, depending upon the antenna and height above land or water, and local terrain, but nominally it's between 10-20 nautical miles. This is good enough for ships traveling at 15 knots or so, and for those monitoring the signals on land. In busy marine areas such as the St. Lawrence Seaway and ocean ports, vessel traffic regulators use a combination of radar, AIS and other methods to track, sequence and guide ships through the system. At lower traffic density ports and traffic areas, such as Thunder Bay, we use a mandatory VHF Traffic Information Advisory System or TIAS inside the Welcome Islands on marine CH12 (156.600 MHz). This system relies on the information given by commercial ships arriving, departing and moving in and around the port. With the addition of AIS this service is enhanced since everyone has an overall picture of what is happening in real time without a word being spoken! The St. Mary's River has a mandatory traffic zone; the Lake Huron zone is voluntary until entering the St. Clair River system where it becomes mandatory again in the rest of the St. Lawrence Seaway.

What Ships show up on an AIS display?

Just about every commercial vessel will have an AIS transponder. Specifically, AIS is mandatory on all ships of 300 gross tonnage and upwards engaged on international voyages, cargo ships of 500 gross tonnage and upwards not engaged on international voyages and passenger ships irrespective of size.



Shipboard AIS transponders sequence transmissions to avoid packet collisions.

Other smaller commercial ships, such as fishing vessels and tugs, can equip themselves with AIS transponders voluntarily since there are major safety benefits. AIS transponders and receivers use two VHF radio frequencies: 161.975 MHz (AIS1, or channel 87B) and 162.025 MHz (AIS2, or channel 88B). 1/30s packet bursts are sent out in a timing sequence alternating between the two frequencies. Since the signal is digital, this effectively increases the signal's bandwidth, decreases the noise level, and reduces possible interference (collisions with other packet signals.)

In the St. Lawrence River system, and other high-density marine areas, coast stations use a duplex repeater system that transmits nautical information about ship traffic, water levels, weather information, etc., to AIS equipped ships in the area. So, it is a 2-way active system from both the land and the sea.

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Monitoring and Tracking Ships (continued from previous page)

What kind of information is broadcast for each ship and how often?

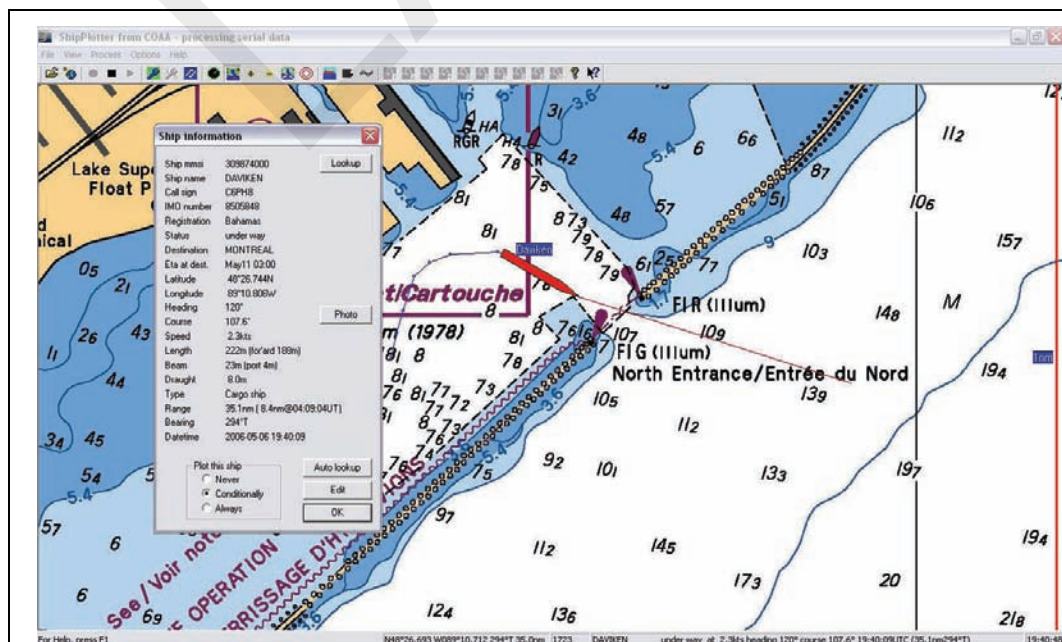
A Class-A AIS transponder broadcasts the following information every 2 to 10 seconds while underway and every 3 minutes while at anchor:

1. MMSI number – a unique maritime mobile system identification number
2. Navigation status - “at anchor”, “under way using engine” or “not under command”
3. Rate of turn - right or left, 0 to 720 degrees per minute
4. Speed over ground - 1/10 knot resolution from 0 to 102 knots.
5. Position accuracy - differential GPS position:
(Longitude to 1/10000 minute and Latitude to 1/10000 minute accuracy.)
6. Course over ground - relative to true north to 1/10th degree
7. True Heading - 0 to 359 degrees derived from gyro input
8. Time stamp - The universal time to nearest second that this information was generated.

In addition, the Class-A AIS unit broadcasts the following information every 6 minutes:

- a. MMSI number - same unique identification used above, links the data above to described vessel
- b. IMO number – a unique identification number (related to ship's construction)
- c. Radio call sign - international call sign assigned to vessel, often used on voice radio
- d. Name - name of ship, 20 characters are provided
- e. Type of ship/cargo - there is a table of possibilities that are available
- f. Dimensions of ship - to nearest meter
- g. Location on ship where reference point for position reports is located
- h. Type of position fixing device - various options from differential GPS to undefined
- i. Draught of ship - 1/10 meter to 25.5 meters (note “air-draught” is not provided)
- j. Destination - 20 characters are provided
- k. Estimated time of Arrival at destination - month, day, hour, and minute in UTC

Please note that some of the information does require someone to type in information (for commercial ships) on a data terminal for transmission by the AIS system, and it may be incorrect, or out of date. This could include the spelling of the ship's name; type of cargo, destination, the ship's status (at anchor, underway, docked, etc.) Fortunately, the critical and important information has been taken out of the hands of the mariner, but no system that involves humans is perfect. If it were, I'd be out of a job!



ShipPlotter display showing ship data, wake trail, and 10 min course vector.

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Monitoring and Tracking Ships (continued from previous page)

Can I legally receive and decode AIS signals?

In Canada and the United States, AIS transmissions are considered to be of a general or "All Stations" nature, not addressed to a specific party or agency, but open to all who can receive and decode them in the marine environment. Most of the data transmitted doesn't reveal any information that couldn't be obtained from other sources. The signals are intended for other vessels as part of the SOLAS (Safety of Life at Sea) program, and for land stations providing vessel traffic services. It certainly doesn't exclude hobbyists from listening in either.

Many also monitor the DSC (Digital Selective Calling) frequencies, and often can assist the coast guard in rescues at sea. We have limited resources and the more eyes and ears out there the better, in my opinion. As long as you abide by the Radio Act of Canada, as it concerns the reception of radio communications within the Maritime Mobile Service, you can freely receive and decode radio signals.

What do I need to receive AIS signals?

Most of us already have all the equipment required to receive and decode packet radio signals. The first is a Celeron™ or Pentium™ desktop or laptop computer running MS Windows™ and a sound card with either a microphone or line input. You need processing power to decode and process the signals using a sound card so the computer should be running at a 1 GHz clock speed or faster with a minimum of 256 MBs of memory (RAM).

You need a 2m receiver or transceiver that supports 9600-baud packet. Most new dual-band radios support both 1200 and 9600-baud packet and have a mini-DIN (actually a PS2 compatible one) jack on the back of the radio. If you have a high-end VHF/UHF scanner or receiver it may have a discriminator output jack (or you can modify your scanner and add one) that takes the IF detected audio out before it gets processed by the AF stages. This discriminator output isn't the same as the 10.7MHz IF output jack commonly found on scanners. With 9600-baud packet, you can't receive and decode the signal using the audio jack like you can with 1200-baud packet.

The best receiver would be a dedicated AIS VHF receiver. Milltech Marine sells a basic model for around \$200 Canadian (it's on sale). Because you feed the packet data directly into your computer's serial port, the sound card isn't used and you need far less computer processing power. As an aside, a former Thunder Bay resident works at Milltech Marine. I was very surprised and amused at just how small a world it has become because of the Internet. Of all the gin joints in the world to buy an AIS receiver!

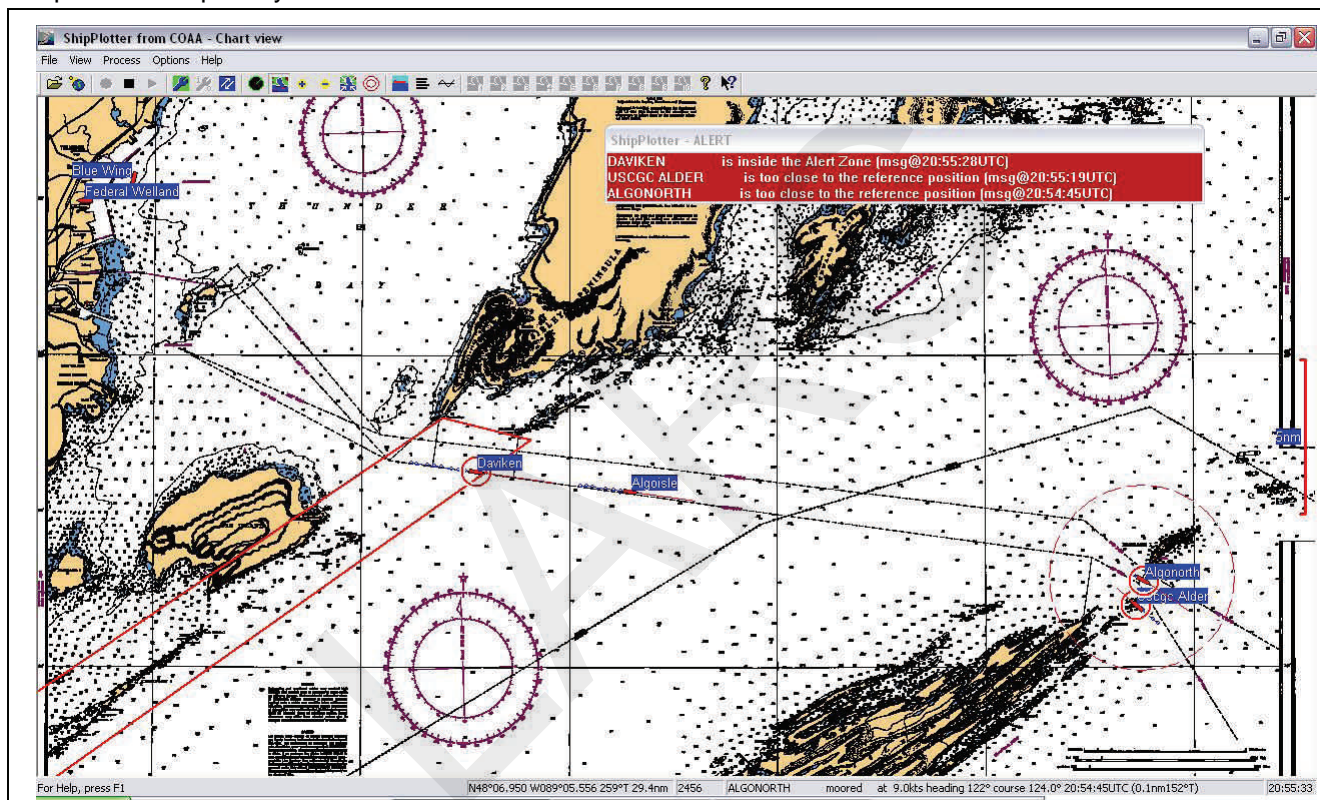
Lastly, you will need the appropriate decoding software. If you are a mariner, you probably have a charting program that can accept NMEA VDM signals direct from a serial port. You may have to use one of those USB to Serial conversion cables since most new computers don't have RS232 serial ports these days. For most of us, we will be using a hobbyist program called ShipPlotter. This program isn't free but you get to try it out for 21 days, after that it stops working and you must purchase a single user license for 25 Euros to unlock it. It worked out to just under \$30 Canadian to buy my single user license. It's really a fantastic program to use, and has many "professional" features as well. The programmer has informed me that it is being used in over 1,000 ports around the world! The Ship Plotter web site has all the information needed to get started in the world of AIS monitoring from home or on your boat out on Lake Superior.

If you download the ShipPlotter program from the website, you will see additional programs and a weblink for creating charts online with automatic calibration for import directly into ShipPlotter. ShipPlotter can directly use BSB KAP charts, JPEG images that you can calibrate, and web charts that you can create and have automatically calibrated. The obvious advantage with a JPEG chart is that you can customize it with labels, colours, etc. I have a package of charts made up that will work with ShipPlotter. Anyone interested can email me with your request. I'll send you a few satellite images and custom charts of the area, some AVI recordings of actual ship movements in the port, and some program settings that I use. Also, if you need further information or are having problems getting things to work, I'm here to help. I won't go into all the technical details on how to hook up your receiver, computer and install and run ShipPlotter. The website gives a very good and detailed account on how to do this. The main thing is to read the help file and all the program prompts. It has a non-standard interface, and takes a bit of use before it starts to make sense.

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Monitoring and Tracking Ships (continued from previous page)**Putting it all together**

I used my FT7800 with a dedicated packet port. For a cable, I took one off a broken PS2 mouse, and wired a mono plug to the 9600-baud audio and ground lines. After installing ShipPlotter, and loading up some charts, I plugged into the packet port on the transceiver and into the mic input on my computer, and tuned up 161.975 MHz (AIS1 or CH87B marine). Now, here's the first problem you will have if you don't read the documentation. You must turn the receiver squelch OFF. Yes, you must have noise rushing out of the speaker. Fortunately, the packet port levels aren't affected, and you can turn down your speaker audio level. You can hear the packet data bursts that sound like a very short pop or click just above the background noise. The mic level needs to be adjusted using ShipPlotter so that there's no clipping in the signal, after that it's all automatic. Press the Process button and any AIS equipped vessels in the area will start to show up as little ships on your charts.



**ShipPlotter customized chart with alert & traffic zones. 6 ships are active in area.
Extended range coverage with a gain antenna.**

Well, I have to close out this article, and I've only barely scratched the surface. Hams have used a similar packet radio system called APRS (Automatic Position Reporting System) for years. Which is why most of you probably had a sense of déjà vu. I've included several AIS and APRS related links that will help you out. AIS and APRS are very useful expansions of what old and slow 9600-baud packet radio can do. There's no reason that an APRS type system can't be setup in the local area for community service events, land search and rescue, in environmental and other disasters, etc.

About Me

I, (Bob, VA3ROM) have been an involved in air/marine search and rescue communications for 30 years. Currently, working for the Canadian coast guard based inside the Keefer Terminal complex. Over the past 16 years, I've written computer applications for use at various coast guard radio centres, and am currently working on a side project involving AIS. Been a ham for 12 years, and hold an advanced ticket with Morse code endorsement. You can reach me via email: va3rom@tbaytel.net (for the ShipPlotter chart package, etc.)

(continued on next page)

Monitoring and Tracking Ships (continued from previous page)

References:

AIS

<http://www.navcen.uscg.gov/enav/ais/default.htm>
http://www.ccg-gcc.gc.ca/mcts-sctm/docs/misc/projects_e.htm
http://www.imo.org/Safety/mainframe.asp?topic_id=754
http://www.greatlakes-seaway.com/en/navigation/ais_project.html
<http://www.yachtinsure.com/news-auto-identification-systems.htm>

APRS

<http://www.aprs.net/>
<http://eng.usna.navy.mil/~bruninga/aprs.html>

Packet Radio

<http://www.febo.com/packet/cheap-9k6/>
<http://www.patmedia.net/ralphmilnes/soundcardpacket/6modes.htm>

Modifying Receivers for Discriminator Output

<http://www.discriminator.nl/index-en.html>

MMSI Numbers

<http://www.marinecomputer.com/articles/mmsi/mmsi.html>

SOLAS

http://www.imo.org/Conventions/contents.asp?topic_id=257&doc_id=647

ShipPlotter

www.shipplotter.com

Milltech Marine

<http://www.milltechmarine.com/>

Dolphin Maritime Software

<http://www.dolphinmaritime.com/software/windows/standaloneais.html>

Fugawi Software

<http://www.fugawi.com/>

SailWx Info

<http://www.sailwx.info/aisinformation.html>



Bob VA3ROM at his impressive work station.

Answers to April 2006 Puzzle

Semiconductor

How did you do?

Across

3. **SILICON**—most common element, the junction barrier voltage is .7 V
6. **SOLAR**—this type of diode cell likes to stay in the sun
8. **HOLE**—P type material has these where electrons ought to be
10. **OPAMP**—high gain direct coupled differential amplifier or this for short
11. **GUNN**—microwave oscillator
13. **HEATSINK**—this gets attached when things get hot
14. **BIPOLAR**—a manic depressive transistor?
16. **ZENER**—this diode always goes in backwards
18. **GAASFET**—depletion mode junction device, the gates are sometime gold

Down

1. **DIODE**—commonly used as rectifiers, made from a single junction
2. **BIAS**—this voltage can be applied forward or backward
4. **CLIP**—to limit the amplitude of a sine wave with a diode
5. **POINTCONTACT**—this diode has a lot less internal capacitance than a junction diode
7. **AMPLIFIER**—transistors are most often found in this kind of circuit
9. **LINEAR**—integrated circuit that is not digital is this....a straight line
11. **GERMANIUM**—small signal diodes are made of this but I don't know what it has to do with Germans
12. **LED**—these diodes glow in the dark
15. **BETA**—current amplification factor
17. **FET**—do farmers grow this kind of transistor?

Thanks to Ed VE3SNW for the puzzle

Editors QSK...

First, I must apologize for the late Hi-Q issue this month.

I managed to break away from the North for a few weeks to a recluse in Palm Bay, FL. Boy, that hurt!!!

While there, I did manage to work Echolink twice, once to Bill **VA3AY** on Echolink direct. This is my first trials on a dialup connection and it was a pleasure to find that it works as well as my high speed connection at the home QTH.

The second call was to **VA3LU**, Terry, via his repeater VA3LU-R. This also worked without any glitches.

I know that several others have been using these systems for some time with IRLP and Echolink, but it was fun and really enjoyable to do it myself!

This months issue was saved from becoming a condensed version with the great article on 'Tracking Ships via 2 Meter Packet Radio' contributed by Bob **VA3ROM**, who did a great job on the article and included several images that bring the text to life.

Next month's issue should be on time, and by submitting your articles and items of interest early, they will have a good chance of being published before we break off for the summer!

Thanks to all the contributors for this months Hi-Q! Your newsletter is only as good as we all make it!

That's it for now.

***—**

73, Leo VE3ATC

email: ve3atc@spruce.ca

Ps. Not a writer and have a story or pictures? Contact me and I will help get it out!

Ps If you are interested in helping with Hi-Q publishing, offers are out to assisting me with layout, content, etc. I guess this would be like a partner position. However, we can make up a great title for the position that will give you warm feelings all over! Contact me for further info!



ON THE WEB

thanks to
John,
VE3EMI



In May 1963, the US Air Force launched 480 million tiny copper needles that briefly created a ring encircling the entire globe.

<http://www.damninteresting.com/?p=516#more-516>

Calculating your 802.11 power output

http://www.radiolabs.com/stations/wifi_calc.html

RF Interference with Wind Turbine Facilities

http://www.andrew.com/search/bn_TP-100321-EN.aspx

More Interesting Links

-tnx to Jim **VE3UA**

Google image of Windfarm in Denmark

http://www.esa.int/esaEO/SEMXXTLVGJE_index_0.html

Receiving Deep Space Spacecrafts

<http://w3ref.cfn.ist.utl.pt/cupido/dsn.html>

eSoftAnywhere DSP & More DSP processing software

<http://www.bill.gallowaysystem.com/ve1exe/konrad.html>

Next regular meeting

Thursday

May 13, 2006

McIntyre Building, Confederation College

Room 191

7:30 pm EDT

CONFUCIUS SAY.....

Confucius say...

"A Shotgun wedding is a case of wife or death."

Confucius Say...

"It's ok to let a fool kiss you, but don't let a kiss fool you."

Confucius Say...

"Never approach a bull from the front, a horse from the rear or a fool from any direction."

THE LAKEHEAD AMATEUR RADIO CLUB JOURNAL

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Hi-Q Editor and Publisher

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Leo VE3ATC 939-1020

Hi-Q is published monthly on the Sunday preceding the monthly meeting. Monthly meetings are held on the second Thursday of each month, except for July and August. Your submissions are welcome at any time. Submit early to ensure publication in next issue! Send to editor at ve3atc@spruce.ca



LARC is a member of [RAC](#)

LARC PUBLIC SERVICES

ARES

District Emergency Coordinator

VE3FAL Fred Lesnick 577-0789

Emergency Coordinator

VA3OJ Randy Gottfred 474-0910

CANWARN

VA3JMS John 767-3631

VE3MXJ Brad 767-0628

PUBLIC SERVICE EVENTS

VE3MXJ Brad 767-0628

VA3JMS John 767-3631

RAC

[Radio Amateurs of Canada](#)

LARC SENATE

Keith Fiske

VE3JQ

Pat Doherty

VE3PD

Dave Kimpton

VE3AVS

Laurie Bridgett

VE3BCD

Terry Stewardson

VA3LU

Ed Baumann

VE3SNW

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VA3JMS 767-3631

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Secretary

Terry Stewardson

VA3LU 577-9439

Treasurer

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VE3MXJ 767-0628

Manuel Migueis

VE3MPT 475-5686

Fort Michelizzi

VE3MCZ 475-0971

Mark Vaillant

VA3MVR

Past President

Bill Unger

VE3XT 344-1848

About LARC

Lakehead Amateur Radio Club members have all levels of interest and knowledge in the wide spectrum of amateur radio.

Monthly meetings and contact with other members allow us to share and discuss different ideas, and to learn from each other.

LARC membership meetings are held the second Thursday of each month, September through June at 7:30 PM local time at the McIntyre Building, Confederation College Room 191

Each meeting consists of a mix of technical and light-hearted topics, with a break for meeting friends and new friends.

Anyone with an interest in ham radio is invited to join us.

Amateur radio classes are also administered by LARC to help you with your Amateur Radio License

contact any of the Executive members above for more information

**2005/2006 MEMBERSHIP/RENEWAL APPLICATION****LAKEHEAD AMATEUR RADIO CLUB INC****1100C MEMORIAL AVE, SUITE 184,
THUNDER BAY, ONT P7B4A3****CLASS OF MEMBERSHIP****FULL MEMBERSHIP \$35.00-open only to licensed amateurs****NAME:** _____ **EMAIL:** _____**ADDRESS:** _____ **CITY** _____**TELEPHONE:** () _____ **POSTAL CODE** _____**MAY WE PUBLISH THE PHONE NUMBER yes / no****MAY WE DELIVER HI-Q BY E-MAIL? yes / no****CALL(S)** _____**FAMILY MEMBERSHIP-** immediate family residing at the same address holding licenses.
\$35.00 plus \$10.00 for each additional amateur.**NAMES AND CALLS**_____

_____**STUDENT MEMBERSHIP-** \$15.00-open to persons enrolled full time in an education
facility, list School and program _____**ASSOCIATE MEMBERSHIP-**\$20.00-upon approval of the Board and open to:**1)Non holders of an amateur radio license.****2)Licensed amateurs living outside the immediate Thunder Bay area or are unable to attend regular meetings of the club.****If you feel you qualify for associate membership, please indicate why, on a separate sheet, to be used by the Board to consider your application.****Please mail or bring this form to the next meeting with your cash or cheque for membership fees.****Cheques should be made payable to Lakehead Amateur Radio Club.****Applications and cheques can also be dropped off at the above address.**